

Application Serial No.: 10/527,364
Amdt. dated November 21, 2007
Reply to Final Office Action of June 26, 2007

REMARKS/ARGUMENTS

The Final Office Action dated June 26, 2007 and the references cited therein have been carefully considered. In response to the Office Action, Applicant respectfully traverses the rejection of independent Claims 10 and 21 and submits that the amendments made herein to Claims 22 and 26 places the application with Claims 10-19 and 21-31 in condition for allowance.

In the Office Action, Claims 10, 17, 19, 21-22 and 30 have been rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,439,871 to Saito et al. in view of Japanese Patent No. JP 06-328489 to Eiji. Claims 11, 13, 14, 24, 26 and 27 have been rejected under 35 U.S.C. §103(a) as being unpatentable over the Saito and Eiji patents and further in view of U.S. Patent No. 5,725,819 to Onishi et al. Claims 12, 15, 16, 25, 28 and 29 have been rejected under 35 U.S.C. §103(a) as being unpatentable over the Saito patent in view of Rosato's Injection Molding Handbook (3rd ed.). Finally, Claims 18, 23 and 31 have been rejected under 35 U.S.C. §103(a) as being unpatentable over the Saito patent in view of U.S. Patent No. 5,424,017 to Hinduja et al.

Applicant respectfully traverses the rejection of independent Claims 10 and 21 in that none of the cited prior art references, taken alone or combined, discloses heating plastic within a mold cavity by compressing the plastic with a movable slide. Applicant has also amended independent Claim 22 to include additional features not found in any of the cited prior art references. Accordingly, it is respectfully submitted that independent Claims 10, 21 and 22, and the claims that depend therefrom patentably distinguish over the prior art.

Saito does not disclose heating plastic in a mold cavity with a movable slide.

With respect to the rejection of the independent Claims 10, 21 and 22 the Examiner states that the Saito patent shows a method for forming plastic products in a mold having a slide moveable within a mold cavity for compressing and/or displacing molten plastic within

the cavity. The Examiner states that, in column 15, lines 14-17 of the Saito patent, it is stated that the speed of a pin can be varied depending on the desired liquid condition of the resin.

However, as noted by the Examiner, there is absolutely no mention in the Saito patent of creating heat in the plastic by compressing a movable slide against the plastic in the mold cavity. On the contrary, the object of the invention disclosed in the Saito patent is to provide plastic products sandwiched between two layers of compressible foam materials. Such procedure by its very nature would prevent heating of the plastic. In particular, as can be clearly seen from Figure 4 of the Saito patent, the plastic material, when injected, is in full contact at all sides with the foam material. As the plastic is injected and subsequently compressed, it pushes the foam material to form a planar laminate structure. Thus, the compression force within the plastic during these steps will be minimal due to the foam and, therefore, there would be no increase of temperature in the plastic material. Indeed, due to the presence of the foam material in the mold, one skilled in the art would likely try to avoid such increase in plastic temperature so that there will be no degradation of the foam material. Accordingly, the Saito patent clearly teaches away from the claimed invention.

Moreover, the plastic layer disclosed in the Saito patent is relatively thick and the cross-section of the flow path is also relatively large. Thus, even if the pressure of the plastic were increased by movement of the slide, the result would only be a widening of the flow path and a reduction in the back pressure. Again, there would be no increase in the temperature of the plastic material, as defined in Claims 10, 21 and 22. Furthermore, there is absolutely no teaching or suggestion of raising the temperature of the plastic to at least the melting point of the plastic, as defined in Claim 10.

The Examiner refers to column 15, lines 14-17 of the Saito patent as disclosing the step of varying the speed of the centering pins to achieve a more fluid resin. Applicant first respectfully points out that the cited portion of the Saito patent describes varying the speed of only the centering pins, as opposed to varying the speed of the movable slide. Applicant next points out that the cited passage only states that the speed of the pins can be varied "in accordance with condition such as the fluidity of the resin." This means that the speed of the pins is set once the fluidity of the resin is known. The speed of the pins does not influence

the fluidity of the plastic. Accordingly, it is clear that the Saito patent does not disclose heating of plastic within a mold cavity by compressing the plastic with a movable slide, as defined in Claims 10, 21 and 22.

Eiji does not disclose heating plastic in a mold cavity with a movable slide.

As discussed above, the Examiner notes that the Saito patent does not disclose the creation of heat with a moveable slide, but cites the Eiji patent as showing a method wherein movement of an object in a mold cavity creates heat, which creates a more fluid resin. Accordingly, the Examiner concludes that it would have been obvious to combine the teachings of the Saito and Eiji patents to arrive at the claimed invention.

Applicant respectfully submits that, even if it were obvious to combine the teachings of Saito and Eiji, the result would not be the claimed invention. This is because neither reference discloses use of a movable slide to create heat. As discussed in detail above, and as noted by the Examiner, the Saito patent does not disclose this feature. Similarly, there is no mention in the Eiji patent of a movable slide for raising the temperature of plastic. Instead, the Eiji patent only discloses increasing plastic fluidity by using an external excitation means. Specifically, the Eiji patent only discloses use of a vibrating "linear trembler" disposed outside the mold cavity to excite the plastic and, therefore, increase its fluidity. (See paragraph [0012].) There is absolutely no teaching or suggestion of using a movable slide within a mold cavity to compress plastic and thereby raise the temperature of the plastic, as defined in Claims 10, 21 and 22.

Therefore, if one were to combine the teachings of Saito and Eiji, the result would be a method in which plastic is compressed within a mold cavity of a mold by a movable slide and is excited by a vibration device disposed outside of the mold cavity to increase the fluidity of the plastic. There is nothing in either reference that would lead one skilled in the art to move the slide within the mold cavity at a speed sufficient to create adiabatic and frictional heat in the plastic, as defined in Claims 10, 21 and 22. Nor is there anything in either reference that would suggest moving the slide at a speed sufficient to raise the

temperature of the plastic to its melting point, as specifically defined in Claim 10. Accordingly, it is respectfully submitted that Claims 10, 21 and 22 patentably distinguish over any combination of the cited Saito and Eiji references.

Claim 22 has been amended to include additional features not found in the art.

Claim 22 has been amended to define a plastic injection step wherein plastic is introduced into an entirely closed mold cavity, but does not completely fill the mold cavity. The plastic is then compressed by a movable slide to heat the plastic such that the plastic becomes more liquid and completely fills the mold cavity. It is respectfully submitted that none of the cited references, taken alone or combined, discloses introducing an amount of plastic in a mold cavity, wherein the plastic does not completely fill the mold cavity, as defined in amended Claim 22. Accordingly, for this additional reason, amended Claim 22 patentably distinguishes over the prior art.

As described in the specification of the present invention, the surprising advantageous result of not completely filling the mold cavity upon injection of the plastic is a drastic reduction in feed pressure and closing pressure required during the molding process. (See page 3, line 28 – page 4, line 30.) An additional result is an improved plastic material flow during molding and a more uniformly distributed plastic in the final molded product.

In contrast, the Saito patent discloses a process whereby plastic is introduced in a mold cavity to completely fill the mold cavity. Specifically, as clearly shown in Figure 4, the plastic is injected into the mold cavity and is subjected to a constant substantial counter-pressure applied by the compressible foam members (21, 22). Indeed, it is expressly stated in column 8, lines 11-15 that “the thickness of the cavity 10A in the moving direction of the movable die 12 is set *the same as, or slightly smaller* than the thickness of the first and the second surface members 21 and 22” (emphasis supplied). Thus, the plastic is forced to fill the entire mold cavity before compression.

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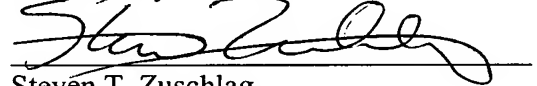
Turning to the Eiji patent, as discussed above, there is no teaching or suggestion of a slide movable within a mold cavity for raising the temperature of plastic injected into the mold cavity. Thus, amended Claim 22 similarly patentably distinguishes over the Eiji patent.

Conclusion

In view of the foregoing amendment and remarks, favorable consideration and allowance of the application with Claims 10-19 and 21-31 are respectfully solicited. If the Examiner believes that a telephone interview would assist in moving the application toward allowance, she is respectfully invited to contact the Applicant's attorney at the telephone number listed below.

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